Printed Pages : 4 TEC505

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3089 Roll No.

B.Tech

(SEM V) ODD SEMESTER THEORY EXAMINATION 2009-10

ANTENNA & WAVE PROPAGATION

Time : 3 Hours] *[Total Marks : 100*

Note : *Attempt all questions.*

1 Answer any two questions of the following : **10×2=20**

(a) Define beam width of an antenna and show that its directivity is given by :

$$D = \frac{41257}{Q_E^{\circ} \cdot Q_H^{\circ}}$$

where Q_E and Q_H are half power beam-width in E and H plane respectively.

(b) A transmitting antenna having an effective height of 70 meters, takes a current of 50 amp (rms) at a wavelength of 600 meters. Find :

(i) Radiation resistance of the antenna

(ii) Power radiated

(iii) Antenna efficiency for a total antenna resistance of $50\,\Omega$.

(c) What is meant by directivity and power gain of an antenna ? Show how the directivity can be increased by using a number of antenna in a suitable array.

2 Attempt any **two** questions of the following : **10×2=20**

(a) Prove that the directivity for a broadside array of two identical isotropic in-phase point sources spaced distances d apart is given by

$$D(\theta, \varphi) = \frac{2}{1 + \frac{\delta m \, \beta d}{\beta d}}$$

(b) A uniform linear array consists of 16 isotropic point sources with a spacing of $\lambda/4$. If the phase difference $\delta = -90°$, calculate :

(i) HPBW

(ii) Beam solid angle

(iii) Beam efficiency

(iv) Directivity and

(v) Effective aperture.

(c) What is meant by Dolph-chebyshev distribution for a linear array ? Show that such a distribution gives a minimum side lobe level for a given beam-width of major-lobes.

3 Attempt any **two** parts of the following : **10×2=20**

(a) Discuss the theory of formation ionospheric regions. Describe the properties of different ionospheric regions with special reference to seasonal variations.

(b) Explain how long, medium and short waves, are propagated over short and long distances and comment on their applications in the field of practical radio communication.

(c) Explain MUF, critical frequency, virtual height, and skip distance as applied to sky wave propagation.

4 Attempt any **two** parts of the following : **10×2=20**

(a) Find out the length L, width W, and half flare angles θ_E and θ_H of a pyramidal horn antenna for which the mouth height $h = 10\lambda$. The horn is fed by a rectangular waveguide with TE_{10} mode.

(b) What is a folded dipole antenna ? Describe an Yagi antenna and explain its operation.

(c) Explain with suitable diagrams the working of the helical antenna under :

(i) Normal mode of operations and

(ii) Axial mode of operations.

What are its applications ?

5 Attempt any **two** parts of the following : **10×2=20**

(a) Measurement of antenna efficiency

(b) Radiation pattern measurement

(c) Log periodic antenna.
